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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/652,993	08/31/2000	Vishnu K. Agarwal	98-0616.03	4012

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EXAMINER

DIAZ, JOSE R

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 11/29/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/652,993

Applicant(s)

AGARWAL, VISHNU K.

Examiner

José R Díaz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 4,76,77 and 81-85 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 4,76,77 and 81-85 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 19, 21.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

➤ Claims 4, 76 and 81 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The claims 4, 76 and 81 fail to further limit the previous claims because Applicant identifies the same chemical compound by using two different labels. For example, the carbon-silicon compounds hexamethyldisilane and hexamethyldisilazane are both known in the art as **HMDS** and having the same chemical composition of  $[(CH_3)_3Si]_2$ .

### *Claim Rejections - 35 USC § 102*

➤ The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

➤ Claim 4 is rejected under 35 U.S.C. 102(e) as being anticipated by Park et al. (US Pat. No. 5,723,384).

Regarding claim 4, Park et al. teach a method for fabricating a capacitor (see Fig. 15) comprising the steps of: introducing a material (e.g. diborane or B<sub>2</sub>H<sub>6</sub>) directly over a conductive layer (35a) (please note that as a result of the passivation of the top surface of the layer 35a, the passivation layer comprised of tungsten nitride is created (see Fig. 15 and col. 4, lines 3-33)).

### ***Claim Rejections - 35 USC § 103***

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

➤ Claim 4, 81-83 and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US Pat. No. 5,723,384) in view of Mak et al. (US Pat. No. 6,162,715).

Regarding claims 4, 81 and 85, Park et al. teach a method for fabricating a capacitor (see Fig. 15) comprising the steps of: providing the first conductive plug (35) (see Fig. 11), providing a WN<sub>x</sub> conductive barrier (39) (see Fig. 15) and forming the second conductive layer (see col. 4, lines 32-33). However, Park et al. fails to teach treating the surface of the barrier surface with a material selected from the group of diborane, phosphine and carbon-silicon compound before to the second conductive

layer is formed. Mak et al. teach a method of forming a second conductive layer over a  $WN_x$  conductive barrier layer (8) by first treating the surface of the  $WN_x$  conductive barrier layer (8) with a gas containing diborane ( $B_2H_6$ ), and then, the second conductive layer (9) is provided (see Abstract, last two sentences and col. 5, lines 9-25). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Park et al. to include the step of treating the surface of the  $WN_x$  conductive barrier layer with diborane prior to forming the second conductive layer. The ordinary artisan would have been motivated to modify Park et al. in the manner described above for at least the purpose of removing fluorine from the reaction.

Regarding claim 82, Park et al. teach that the conductive plug (35) can be formed of polysilicon (see col. 3, lines 57-59).

Regarding claim 83, Park et al. teach a barrier layer (39) formed of  $WN_x$  (see Fig. 14).

➤ Claim 4, 81-83 and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US Pat. No. 5,723,384) in view of George et al. (US Pat. No. 5,332,444).

Regarding claims 4, 81 and 85, Park et al. teach a method for fabricating a capacitor (see Fig. 15) comprising the steps of: providing the first conductive plug (35) (see Fig. 11), providing a conductive barrier (39) (see Fig. 15) and forming a second conductive layer (see col. 4, lines 32-33). However, Park et al. fails to teach treating the surface of the conductive barrier surface with a material selected from the group of

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diborane, phosphine and carbon-silicon compound before to the second conductive layer is formed. George et al. teach a HMDS treatment for conductive substrate to reduce the ability of such conductive substrate to associate with oxygen (see col. 7, lines 6-9 and 18-31). Please note that such a treatment is performed prior to forming a second conductive layer (see col. 7, lines 6-9 and 18-31). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Park et al. to include the step of treating the surface of conductive substrate comprised of a barrier layer and a first conductive plug with HMDS prior to forming the second conductive layer. The ordinary artisan would have been motivated to modify Park et al. in the manner described above for at least the purpose of removing oxide contaminants residing on the surface of the conductive substrate.

Regarding claim 82, Park et al. teach that the conductive plug (35) can be formed of polysilicon (see col. 3, lines 57-59).

Regarding claim 83, Park et al. teach a barrier layer (39) formed of  $WN_x$  (see Fig. 14).

➤ Claim 84 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US Pat. No. 5,723,384) in view of Mak et al. (US Pat. No. 6,162,715), and further in view of Mak et al. (US Pat. No. 6,309,713 B1).

Regarding claim 84, a further different between the present invention and the prior arts is the material used as the second conductive layer or upper electrode. Mak et al. ('713) teach that is well known in the art to use copper as the second conductive layer in a capacitor structure comprised of a  $WN_x$  barrier layer (see col. 4, lines 62-67

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and col.5, lines 13-15). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to further modify Park et al. to include a second conductive layer formed of copper. The ordinary artisan would have been motivated to further modify Park et al. in the manner described above for at least the purpose of providing electrical contact to other semiconductor devices.

### ***Double Patenting***

➤ A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

➤ Claims 76 and 77 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 76 and 99 of copending Application No. 09/652,840. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented. The claims are directed toward the same method of affecting a surface of a tungsten nitride layer by exposing the tungsten nitride layer to a material selected from the group consisting of: diborane, phosphine and a carbon-silicon compound such as methylsilane, hexamethyldisilane, and hexamethyldisilazane; and providing a polysilicon layer on the tungsten nitride layer.

➤ Claims 81-85 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 102-105 of copending Application No. 09/652,841. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented. The claims are directed toward the same method of affecting a surface of a tungsten nitride layer on a capacitor comprised of a first conductive plug by exposing the tungsten nitride layer to a material selected from the group consisting of: diborane, phosphine and a carbon-silicon compound such as methylsilane, hexamethyldisilane, and hexamethyldisilazane; and providing a polysilicon layer on the tungsten nitride layer.

#### ***Response to Arguments***

➤ Applicant's arguments with respect to claims 4, 76-77, and 81-85 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

➤ Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

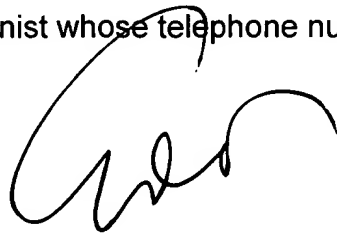
### ***Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00-5:00 Monday, Tuesday, Thursday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 746-3891 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD  
November 22, 2002



EDDIE LEE  
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